

REPORT

OF THE

DEPARTMENT OF AGRICULTURE

1960

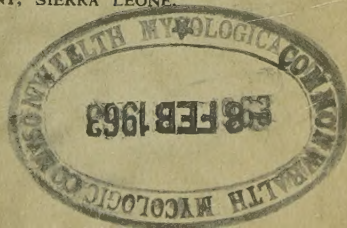
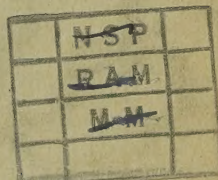


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REPORT
OF THE
DEPARTMENT OF AGRICULTURE
1960



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M. B. Morphy.

Cocoa Officer:

J. E. Clayphon.

Stock Verifier:

A. V. A. Harleston.

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REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1960

PART I—POLICY AND GENERAL REVIEW

Although mention was made in the 1959 report of the need for a clear statement of Government's agricultural policy for Sierra Leone, work on the draft statement referred to was held up for various reasons, and an agreed policy had not been arrived at by the end of the year. The department, therefore, continued to base its work, and efforts, on the policy laid down in previous years, namely:

“to ensure the best land use, by conserving the productivity and fertility of the soil, and to encourage a balanced production of food and cash crops and livestock with surpluses for export, to the best advantage of the community”.

2. However, in view of the imminence of independence, and the necessity as far as possible to increase production, a number of schemes of far-reaching importance were begun, the principal efforts being directed towards increased poultry production and land reclamation.

3. There were, imported in 1960, £26,000 worth of eggs, and considerable quantities of poultry. Meanwhile, the local poultry industry was expanding considerably and it was plain that the demand for poultry, particularly day-old chicks, could not be met from the existing facilities at Newton, let alone meet anticipated future requirements. Construction of a new hatchery, with a maximum capacity of 18,000 chicks per month was therefore begun, the capital cost being met from Colonial Development and Welfare funds. This hatchery, which is due to come into operation in mid 1961, should meet the needs of the country for many years to come.

4. A minor, but interesting development was the introduction of Beltsville Small White Turkeys. These are doing well and demand for them has been high.

5. In the Rhombe area of the Scarcies, a detailed survey was undertaken, to enable plans to be drawn up for the possible reclamation of up to 17,000 acres of land for rice cultivation. This survey will be completed by the end of the dry season, in 1961. Future development of the area will depend largely upon the availability of funds, although there are other sociological factors, such as the migration of labour to farm such a large area, where little suitable land for housing is available, to be considered.

6. The scheme for the distribution of improved varieties of rice seed from Rokupr, through master farmers, which was referred to in the 1959 report, was implemented by the setting up of Departmental seed multiplication farms. It is hoped that within the next year or two, not only will new and better yielding varieties be widely available, but that the grading of rice will become a reality.

7. The Department's contract ploughing service is now an established part of the farmer's life, especially in the Bonthe area, and there has been a welcome revival of interest in the North. Not only has the temporary set back due to the change in policy from payment in arrears to payment in advance, been overcome, but farmers, having a cash stake in the crop from the beginning are showing a much higher standard of husbandry, with consequent increased yields.

8. Agricultural production in 1960, in general again showed a small increase, and there were record crops of coffee and cocoa, although falling world prices resulted in a drop in actual value. The production of Palm Kernels was disappointing, in spite of the high subsidised price paid by the Produce Marketing Board.

9. It is difficult to persuade producers that the price paid for their crops depends upon world factors, and that to retain a price in a highly competitive market, it is necessary to improve standards of husbandry, processing and grading. Only too often, when prices fall, the standards of maintenance of plantations also fall. Rather than undertake the extra work required to maintain, or even improve the yields of their farms, and so enjoy a reasonable income, many farmers, adopt the attitude, when prices are low, that "it is not worth while" harvesting a particular crop, and often turn their attention to work which they think may prove more lucrative. Unless there is a serious change of heart, there can be little hope of any great expansion in export crops. As the national income still depends to a large degree on these crops, not only by way of overseas trade, but also on the revenue derived from export duties, any marked drop in production could have serious consequences for the country as a whole.

10. Efforts to attract outside capital for the development of new crops continued, and considerable assistance was afforded to the Aureol Tobacco Company in their leaf growing project in the North. A consortium of companies interested in banana production began to investigate the possibilities of large plantations in the Torma area, and was also given assistance by the Department. Rubber clones were maintained and multiplied, so that should interest in this crop develop, planting material will be available.

11. As usual, the Headquarters of the department at Njala entertained a large number of visitors, and the most notable being His Excellency the Earl of Listowel, Governor-General of Ghana, in February.

12. Other visitors included various trade delegations, a Parliamentary delegation, and many members of F.A.O., and other research and technical organisations.

13. The Department was represented at the Sixth Commonwealth Mycological Conference, the Overseas Services Spring Conference, and the Health Education Council Conference. In addition, close liaison was maintained with such bodies as the Commonwealth Agricultural Bureaux, the West African Institute for Oil Palm Research and the West African Institute for Cocoa Research. A party also accompanied the Honourable Minister of Natural Resources to experimental stations in Guinea in August.

14. All in all, the year may be said to have been one of sound consolidation, and steady progress.

A.—THE PROVISION OF ADEQUATE FOOD FOR THE PEOPLE

15. *Rice*—Although not as large as in 1959 the upland rice crop was better than the average of the past several years. Yields from Swamplands were also good and the imports of over 24,000 tons of rice made during the year were not required for immediate consumption.

It is probable that no imports will be necessary in 1961, particularly as with the commissioning in 1960 of the two new rice mills, at Torma and Kissy, it was possible to commence the milling of the large stocks of local swamp rice which had not been utilized because of the lack of milling facilities.

16. As was forecast last year the reduction in acreage, following the implementation of the policy of full advance ploughing fee payments, proved to be temporary. The Department's mechanical cultivation scheme is now on a permanent and sound footing. Farmers pay in advance for the cultivations they require; they are unlikely to be tempted to farm larger areas than they can adequately weed and harvest although in the past this was sometimes the case, as payment of fees after harvest encouraged speculation. Documentation has been reduced and the thankless task of chasing debtors has ended.

17. The following table shows the acreages ploughed since 1951. In 1949 and 1950 4 and 69 acres respectively, were ploughed in Southern Circle.

<i>District</i>	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Southern Circle ..	282	465	1,178	2,278	4,073	5,530	5,302	4,346	4,389	5,508
North-western Circle	80	645	683	757	1,014	2,008	2,334	320	243	592
South-western Circle	32	719	1,018	1,012	1,173	1,484	1,606	1,015	600	680
Northern Circle ..	—	238	915	2,449	3,600	2,819	2,625	1,504	356	926
North-eastern Circle	—	30	163	127	141)	250)	160	206	319	594
Colony ..	—	—	—	4	65)	250)	160	44	21	50
Total ..	394	2,097	3,957	6,627	10,066	12,091	12,027	7,435	5,928	8,350

18. Further progress was made with the Water Development Scheme on the Great Scarcies. Over 1,300 acres were reclaimed in the Yakban swamp. Large areas of first class rice land have been planted by farmers but unfortunately land disputes in the Makot and Rosino areas prevented the complete allocation of all suitable land.

19. A survey of the Rhombe swamp on the Little Scarcies was commenced by Messrs. Storey and Partners under a scheme financed by Colonial Development and Welfare funds. This vast swamp of over 17,000 acra may prove amenable to development by mechanical means and the survey in progress will provide information as how this may best be done. Investigations of the Ribbi-Bumpe swamps in the south were also begun.

20. With the revival of ploughing in the north, there was a slight increase in the sale of fertilizer, and the value of fertilizer is also being increasingly recognised in other areas and for other crops.

21. *Other Food Crops*—No real changes in the production of other crops occurred. The trial onion growing scheme on the Bullom shore was promising, and it is intended to extend it. There was also a small but gratifying improvement in the supply of vegetables and fruit around the urban centres of population.

22. *Livestock: Cattle*—The difficulties in marketing cattle remain largely unresolved. The Cattle Owners' Co-operative referred to last year did little business. An organised marketing system is essential, if progress is to be made in this branch of the industry.

23. *Pigs*—The pig industry on the other hand, continued to expand, over 250 animals being sold by the Department for breeding and rearing purposes, mostly around Freetown and Bo. The provision of adequate supplies of feeding stuffs for both pigs and poultry may become a problem in the near future, although the setting up of additional rice mills has increased the production of broken rice and rice bran. It is interesting to note that the import of animal feeding stuffs (not including unmilled cereals) rose to nearly 9,000 cwts. in 1960, compared with only 1,500 cwts. in 1958.

24. *Poultry*—Poultry keeping again made rapid strides and the Department's station at Newton was quite unable to keep pace with the demand, especially for day-old chicks. Well over 10,000 birds were sold from the various agricultural stations, about one-third as day-olds. This is double the production for 1957.

25. Although over 160,000 eggs were sold from departmental stations for hatching and table purposes, and an unknown, but considerable and ever increasing number from private enterprises, the value of the import of eggs remained at the high figure of £26,604.

26. In view of the present expansion, and the potential expansion of the poultry industry within the next few years, work on a new hatchery, with a maximum capacity of 18,000 chicks per month was begun at Newton, and every effort made to bring it into production at the earliest possible date. This is expected to be by mid 1961. In addition to the hatchery, imports of poultry were made to form the basis for closed breeding flocks. These steps should enable the Department to meet all demands made on it for many years to come.

B—THE CULTIVATION OF CASH AND EXPORT CROPS

27. *Cocoa*—Exports for the calendar year totalled 3,250 tons worth £696,129 compared to 2,617 tons in 1959. This production is a new record. For the 1959/60 crop season production was still higher at 3,491 tons compared to 2,851 tons in the previous season. The average value per ton of cocoa exported fell to £214 from £268 in 1959 and £309 in 1958 and thus the total value of the increasing production has unfortunately declined. At the years end world prices had fallen to the region of £170 per ton.

28. Quality remained high with over 99 per cent Grade I.

29. The initial cocoa virus reconnaissance survey was completed for the main cocoa area and outbreaks of the "Wunde" type, of the "Giehun" type and of the "Gandorhun" type were reported. It is now agreed that the "Wunde" symptoms may not be caused by a virus. The virus of the other two types has been investigated at W.A.C.R.I. and are considered to be similar to the mild virus strains of Ghana and Nigeria.

30. A modified detailed survey was commenced. Much valuable information regarding the extent of capsid attack, Black Pod disease and proportion of land area under permanent tree crop and farm crops has been collected. In the area surveyed nearly 10 per cent of the land area is occupied by coffee.

31. The control scheme for Black Pod disease was extended and cocoa Marketing Co-operatives had fifty knapsack spraying machines in use during the year. Trials of various insecticides against capsids were continued. Monkey drives continued and a total of 16,789 head in Kenema and 22,232 head in Pujehun and Bo Districts were killed.

32. At the end of the year 1,000 pods of Amazonian cocoa were received from W.A.C.R.I. and the seed was sown in special nurseries for propagation of seedlings for sale to farmers in 1961.

33. Export duty was reduced to $7\frac{1}{2}$ per cent *ad valorem*.

34. *Coffee*—Yet a new record for coffee exports was reached, 5,093 tons being exported worth £649,491 compared to 4,833 tons worth £960,998 in 1959. These figures reflect the fall of world prices which has continued since 1954 when the average export value was over £300 a ton. In 1959 the value was £199 and further falls during 1960 resulted in an average value per ton exported of the very low figure, £127.

35. There are now signs that farmers are reacting to these low prices and it may well be that production will fall even though large areas of young coffee are coming into bearing. Plantation management has not improved; with the increased individual tree yields which could be obtained, production would remain economic even at the low price levels now operating.

36. To retain a place in the extremely competitive market it becomes even more urgent that processing standards be improved.

37. *Palm Kernels*—Production of kernels fell back to the 1958 level of 54,525 tons worth £2,916,803. The Produce Marketing Board maintained the producer price at £31 12s. throughout the year but this did not however lead to an increase in production.

38. Planting began at the Sahn Malen and Kasse plantations. The Production Division of the Produce Marketing Board are to take over these plantations together with those established by this Department at Masanki and Waterloo early in 1961.

39. *Palm Oil*—No imports of palm oil were necessary.

40. *Ginger*—Only 552 tons were exported compared to 1,054 tons in 1959. The export value per ton however rose to £133.

41. *Kola nuts*—Production increased to 1,371 tons worth £149,833.

42. *Piassava*—Exports of Prime Sherbro piassava rose to 640 tons and of Sulima Piassava to 5,163 tons in all worth £273,011.

43. *Beeswax*—The marked increase in production reported last year has improved further to 61 tons worth £24,886.

C.—SOIL CONSERVATION

44. Sheet erosion is recognised as an insidious problem. No practical solution is yet possible as this would involve a radical change from the traditional shifting cultivation of the upland. The department has however long advocated the fullest possible use of swamps for rice cultivation and proper land use of the uplands.

45. No specific anti-erosion measures were undertaken although the Cattle Owner Settlement Scheme in Koinadugu District has as one of its objectives the prevention of overgrazing. Small scale terracing is actively encouraged in the Colony hills.

D.—THE QUALITY OF AGRICULTURAL PRODUCE

46. Cocoa quality has been maintained at a high level. The quality of coffee has improved considerably with the tightening of the produce inspection regulations but revision is still needed to limit the percentage of black beans; in the Ivory Coast no black beans are allowed and this high standard must be the eventual objective.

E.—STAFF TRAINING AND AGRICULTURAL EDUCATION

47. The long established courses for Agricultural Instructors in Training continued to be held. One group completed their course and were posted to the field.

48. Mr. M. B. Alpha obtained his D.T.A. at I.C.T.A. and returned to take up duty as an Agricultural Officer in September.

49. Mr. W. E. Taylor who is studying for his B.Sc. (Entomology) will sit for his final degree in 1961. Mr. I. May-Parker commenced his second year course at Reading where he was joined by Mr. E. A. Robinson to start his first year; both are reading for a B.Sc. (Agric.) Mr. O. M. Cole commenced a year of practical farm work prior to his following Robinson to Reading. Mr. H. B. N. Will commenced study for a B.Sc. (Agric. Chem.) at Nottingham.

50. Departmental Scholars included Messrs. Attere-Roberts and Sama who completed their courses at Brackenhurst and went on to Auchincruive to take the C.D.A. Mr. A. U. Beckley completed his first year at Seale-Hayne and should obtain his diploma in 1961. Mr. Adi Pratt left in September for his preliminary Farm Institute Course at Brackenhurst and Mr. S. A. Gardric went to Writtle to do a C.D.H. Mr. S. S. Jackson commenced a special course in Poultry Husbandry in September at Auchincruive and Miss S. Lamboi also went to the West of Scotland College to do a S.D.P.H. and N.D.P.H.

51. Mr. A. A. Koroma successfully completed his course at Seale-Hayne and returned with C.D.A.

52. Messrs. Pujeh, Brown, and Knox, Agricultural Instructors, were sent to Israel under the sponsorship of the Israeli Government, to study modern methods of poultry production and citrus growing.

F.—RESEARCH

53. The happy position reported last year of four different specialist officers in post at Njala together alas! did not continue. In June Mr. C. T. Pyne, Plant Pathologist proceeded on leave and on his return from leave in October he resigned to take up a post in Government Service in Nigeria.

54. In May the post of Principal Agricultural Officer (Research) was filled by promotion and the duties of this officer will primarily be the administration of the research branch, the dissemination of practical recommendations to Field Officers and liaison with other research organisations.

55. The Chemist seconded from the pool of Colonial Soil Surveyors completed his field work in June and after a period of laboratory work at Rothamstead completed his report and maps which await publication.

56. The Entomologist continued his investigation into the severity of capsid attack on cocoa in the South-eastern Province and laid down field trials to determine the best methods of capsid control. Additionally he carried out studies of other cocoa and coffee pests.

57. The Rice Research Station at Rokupr as usual submitted a separate report on the year's work. Close co-operation was maintained with the West African Institute for Oil Palm Research through its sub-station at Njala and valuable assistance was received from the West African Cocoa Research Institute who supplied seed of new strains of Amazonian cocoa for trials.

58. The Agricultural Chemist carried out soil surveys; in particular an area of approximately 14,000 acres at Sorogbwema was reported on to assess its suitability for development as a rubber plantation.

G.—GENERAL

59. 1960 was, a satisfactory, if not spectacular year. The results of much hard work on surveys, and other fundamental projects will not be known until reports are available and have been studied in 1961. Only on the basis of such knowledge can realistic schemes for the utilization of such areas as the boli-lands and Rhombe swamp be prepared. Many of the schemes begun in earlier years have been consolidated, and put on a sound footing. Some have come to be accepted as part of normal farming practice. It may be fairly said, that sound and steady progress has been made on established lines, and the foundations for future expansion laid.

60. The publication of instructional pamphlets continued, two new ones, on vegetable production and how to grow Robusta coffee being issued, and one further number prepared. In addition, a number of leaflets both in English and the vernacular, were distributed, on such subjects as the objects of the Cocoa Virus Survey, Monkey Drives, and the Cocoa fermentation.

61. Although the Royal Visit was postponed until 1961, work on the Royal Show ground at Kenema continued at a modest pace, as this ground is intended to become a permanent site for shows and exhibitions.

62. In conclusion, I wish to pay a particular tribute to the former Director of Agriculture, Mr. J. W. D. Goodban, O.B.E., who was responsible for the programme and results achieved in 1960. The present writer is merely presenting and reporting the results of Mr. Goodban's administration.

63. My thanks are also due to all grades of staff in the Department for the work they have done during the year under review.

J. M. DENT,
Director of Agriculture.

February, 1962.

PART II—THE WORK OF THE DEPARTMENT OF AGRICULTURE

A—ORGANISATION AND STAFF

64. Mr. J. W. D. Goodban, O.B.E., Director of Agriculture retired with effect from the 11th of December, 1960. He came to Sierra Leone on the 29th of November, 1956 from British Honduras where he had served as Director of Agriculture for several years. News of his departure was received by all members of the staff with great regret.

65. Mr. T. S. Jones, O.B.E., Deputy Director of Agriculture, left on transfer to Uganda in May, after serving for 14 years in the territory. Mr. J. P. Law, Agricultural Officer, retired on pension under the Retiring Benefit Scheme.

66. The vacancy caused by Mr. Goodban's retirement has been filled by the promotion of Mr. J. M. Dent to be Director of Agriculture, Mr. J. A. C. Davies was promoted to the post of Deputy Director of Agriculture on the 11th of December, 1960. Mr. D. O. Williams was promoted to the post of Principal Agricultural Officer (Research) with effect from 31st May, 1960. Mr. A. K. Murray was promoted Principal Agricultural Officer with effect from 11th December, 1960.

67. Mr. D. Watson, Agricultural Superintendent retired in December and Mr. C. T. Pyne, Plant Pathologist resigned also in December.

68. A very welcome intake of new Agricultural Officers arrived in Sierra Leone on the 4th of August, 1960 namely M. B. Alpha, T. G. Marks, R. A. Bohun and J. Roche. Mr. D. J. Bick arrived on the 13th of October, 1960 to take up appointment as Agricultural Superintendent.

69. Mr. P. V. Sellu was promoted Agricultural Superintendent with effect from 1st December, 1960.

B—AGRICULTURAL STATIONS

Experimental Station, Njala:

70. Experimental work with field crops continued. Special regard was given to groundnut variety and seed dressing trials.

71. In addition selection of cassava varieties from Nigerian hybrid seed and an investigation into the vegetative propagation of robusta coffee cuttings were made. The "Continuous yam experiment" and the "Groundnut exhaustion trial" were discontinued because it was considered that these experiments could not provide any further useful information. The results of these trials were given in Appendix III of the 1959 report.

72. Nursery work during the year was directed mainly to the germination of extension work seed from Nigeria. A consignment of D x P seed—Grades II and III was received from Nigeria in mid-October. Germination was satisfactory. During the year 58,000 seedlings—raised from previous consignments of seeds were sent to Sahn and Kasse for the establishment of the new plantations. 30,000 seedlings were sent to the South-western Circle and 14,000 to the North-western Circle.

73. A consignment of 16,000 Tjir 1 x Tjir 16 rubber seed was received from Liberia in September. 10,000, 4,000 and 2,000 of these were distributed to the South-western Circle, South-eastern Circle and Njala station respectively. The Njala seed germinated well and should be fit for budding in September, 1961.

74. Other nursery work included the budding of citrus and rubber seedlings, propagation of coconut and coffee seedlings and the propagation and distribution of ornamentals and the nursing of new mango varieties introduced from Guinea. 12,500 Robusta coffee seedlings were raised of which 5,000 were distributed in the north Moyamba area.

75. Individual yields were recorded of all coffee trees. Because yields were generally lower than the 1959/60 harvest the limit set for the high yielding trees was lowered to 10 lbs. of cherries. There is little correlation between this year's high yielding trees and the previous two years' selected trees. It would appear that before any selection of high yielding trees is made the average of 4-5 years' yield figures are required and preferably 8-10 years'.

76. Trials were started during the year to find out how successful would be the vegetative propagation of robusta coffee cuttings. 24 per cent of the cuttings rooted in the first six weeks—47 per cent after nine weeks and 65 per cent after 15 weeks. 24 percent of all cuttings died before rooting and 8 per cent after rooting. During the year material for the vegetative propagation of six varieties of Robusta coffee was received from Nigeria. Cuttings were successfully raised from Uganda Robusta G 98, Uganda Robusta G 122, Quillou C 155, Quillou C 39 Java E 107 and Gold Coast A 110.

77. Citrus was again yield recorded. An outbreak of scab was noted but this proved to be a very mild attack. Perenox fungicide will be used as a control measure in 1961. Block 29 was cleared of pineapples. 3,000 slip suckers were collected plus a further 1,800 from Block 37. These were distributed to the various Circles as required.

78. *Pigs*—The pigs remained in good health during the year. Twenty litters were farrowed with a total of 173 piglets and an average litter size of 8.13. The rearability average to weaning was 6.09. Forty animals were sold for pork, 18 for breeding and 72 were transferred to other Agricultural Stations for re-sale as breeding stock.

79. *Poultry*—The health of the poultry improved greatly during the year. This was mainly due to the introduction of an improved ration, stringent control of Fowl pox and Fowl pest vaccinations and the use of coccidiostats. Practically the whole of the Light Sussex flock was culled and was replaced by growers from Newton. Due to low egg production hatchings were also low; 3,139 chicks were hatched against the 1959 total of 5,277 and 2,300 were sold as 6-8 week old chicks. Fertility remained almost steady at 77.4 per cent—hatchability rose from 68.3 per cent to 74 per cent but rearability fell from 66.9 per cent to 61.3 per cent.

80. Demand for ducks was again very low. Because they have been declining in popularity for the last few years it was decided to discontinue keeping them at Njala.

81. *Rabbits*—The health of the rabbits remained good. They are still very popular in this area and fit into the scheme of backyard small stock keeping. Seventy-two babies were kindled. thirty-three pairs were sold locally as breeders.

Experimental Station, Newton

82. *General*—Work continued along the lines of previous years but there was increased emphasis on poultry production.

83. *Cattle*—The health of the herd remained satisfactory but it became evident, that cattle cannot be kept successfully at Newton on an economic basis. Shortage of fodder was again experienced and the cattle had to be transferred to Waterloo Oil Palm Plantation. Poor nutrition and old age resulted in low fertility; only four calves were born during the year. Their average birth weight was 35 lbs.

84. *Pigs*—There were a few isolated cases of trypanosomiasis at the onset of the rains. The health of the pigs has been generally good. Injections of antrycide chloride to all females just prior to their heat period was adopted. This treatment proved effective in improving conception and reducing the number of abortions.

85. The demand for weaner pigs remained great; 182 weaners and 24 growers were sold as potential breeding stock. Only 29 animals were sold for pork.

86. *Poultry*—There was a marked increase in sales during the year. 3,264 chicks were sold at day-old—4,436 at 6-8 weeks and 931 growers and adults. The demand far exceeds the supply—especially for day-old chicks. The number of chicks hatched remained at approximately 14,000. Average fertility fell slightly from 76.4 per cent to 74.3 per cent but hatchability and rearability rose from 71.9 per cent to 77.4 per cent and 66.6 per cent to 79.4 per cent respectively. Egg production showed an increase from 123,039 to 185,724 of which some 33,000 were incubated and 138,280 sold for table purposes.

87. Due to the heavy demand for day-old chicks and growers it was decided to build at Newton a hatchery equipped with mammoth incubators capable of meeting the needs of the whole country. £12,000 were made available from Colonial Development and Welfare Funds to cover the capital cost of buildings and equipment. The scheme is well on the way towards completion and will be in operation by mid 1961. It will be capable of producing a maximum of 18,000 chicks per month. In May, 500 light Sussex and 100 Golden Legbar pedigree chicks were imported from the United Kingdom to form the basis of the future closed flocks. The Lerner system of breeding will be practiced because it lends itself to the conditions prevailing at Newton.

88. *Turkeys*—300 Beltsville Small White Turkey poults were imported in March and April. Owing to neglect 50 per cent of them died in transit but of the balance 118 were reared successfully and are being retained as a nucleus breeding flock. Demand for this stock—new to Sierra Leone is high.

89. *Ducks*—Owing to the press of other work—shortage of staff and the need of all available incubator space for chick production the ducks only received routine attention. There was a general decrease in all three flocks of Aylesbury, Muscovy and Khaki Campbells. In view of the present limited demand for duck eggs the Khaki Campbells are being reduced to only token proportion. The demand for Ayelesburys as table ducks remains steady and attention will be given to the building up of the flock in 1961.

90. *Rabbits*—The health of the rabbits remained good but fertility was low. Only 41 rabbits were kindled of which 37 were sold to local farmers. Demand has fallen off considerably in the Colony area over the last few years so it is proposed to transfer the balance of the stock to Njala.

91. *Model Holding*—The occupant continued to prove unsatisfactory and had his lease terminated at the end of the year. The return from his farm was low owing to his lack of effort and interest. The swamp area which had been fallow for several years, was planted with Radin China 4 and gave a satisfactory yield.

92. *Tree Crops*—Yield recording of oil palms by the West African Institute for Oil Palm Research staff continued throughout the year. There was a small decrease in overall yield due to declining fertility in the older blocks and the incidence of stem rot in a number of palms. The total number of bunches harvested from 3,690 trees was 14,446 with a total bunch weight of 202,809 lbs. The citrus, coconut, avocado pear and cashew blocks all showed decreased yields due no doubt to the very long drought during the latter part of the year. Routine maintenance was continued.

93. *Annual Crops and Grassland*—Little work other than maintenance was done in this section during the year except in the case of pineapples. It had been hoped to produce a trial shipment for the United Kingdom but difficulty was experienced in obtaining sufficient fruit at the correct time.

94. A fertiliser trial was put down to examine the effect of NPK singly and in combination on growth and fruiting. Six plots were laid out measuring 30' x 30'; suckers were planted 12" apart and 18' between rows. NP and K were applied at the rate of 1 oz. per plant and NPK mixture at the rate of 2 oz./plant every four weeks throughout the rains. The NPK plot was duplicated and there was one control. At the end of the year there was a considerable difference in growth and appearance in the plots treated with the complete mixture. The experiment continues towards the fruiting season; full details will be given of the results in the next report.

95. *Intensive Valley Cultivation*—Demonstration of intensive valley cultivation in the East Valley was continued. The usual vegetable crops were grown during the dry season followed by a crop of Radin China 4 which yielded 933 lbs. of paddy per acre. During one very heavy rainstorm the dam burst and caused considerable damage to the standing crop. A small quantity of pineapple suckers was received from Guinea and planted in the upland. The varieties introduced were Albagazi, Red Spanish, Yapo and Natal. These are being propagated to provide additional planting material for future trials.

Animal Husbandry Station, Musaia:

96. *Cattle*—Policy continued along the established lines aimed at obtaining an early maturing strain of Ndama cattle by selection and breeding. The policy of running bulls with the cows during the dry season first initiated in 1956 was resumed and breeding during the rains has been discontinued altogether. Heat periods are longer during the cool nights of the harmattan and higher conception rates have been recorded as a result of this policy which also helps to mitigate the effects of helminthiasis.

97. The following table of figures gives conception rates:—

Year	Month Served	No. Served	No. Calved	% Conception
1959	.. April	33	29	82
	May	16	13	81
	June	19	11	58
	July	13	2	15
	August	9	3	33
1960	.. January	3	3	100
	February	30	30	100
	March	14	14	100
	April	10	9	90
	May	13	10	77
	June	1	—	0
	July	4	—	0
	August	3	—	0

98. Ninety-seven cows calved during 1960; the average calf weight at birth was 34.5 lb. and at weaning 216 lb., the latter being the highest average yet recorded. A supplementary ration was given to cows and calves during the dry season consisting of:

Rice bran	..	..	4 lb/cow/day
Groundnut cake	..	..	1 lb/cow/day
Cassava (or sweet potato and salt)	..	..	2 lb/cow/day

The cost of the mixture was 5½d. per cow per day. This ration contributed to high weaning weights recorded.

99. The herd was reopened during the year to admit one bull and eight heifers purchased from local herds.

100. Routine inoculation against Rhinderpest, Anthrax, Black quarter, and Contagious abortion were carried out. The whole herd were vaccinated against Haemorrhagic septicaemia in September after a number of deaths and this will in future be routine. Suckling calves were dosed monthly with Piperazine and mature stock regularly with Minel.

101. *Sheep*—Health improved considerably and the flock increased in size to 95 by the end of the year. 74 lambs were born but 12 did not survive, 8 sheep also died during the year. The flock was inoculated against Anthrax and Blackquarter as a routine measure and dosed twice with Minel.

102. *Poultry*—Though production showed an increase, fertility (71.2) and hatchability (60.7 per cent) figures were lower than last year. 743 birds were sold and 21,375 eggs were laid of which 5,600 were incubated.

103. *Maintenance*—The greater part of the fencing programme was completed comprising virtually the whole of the perimeter fence, the herd areas in the new lease and the bisection of the latter. When completed there will be 17 herd areas bound by permanent fences.

104. *Pasture Work*—A robot cabbage planter arrived in August and was satisfactory for planting grass cuttings. 5 acres of Para grass *Brachiaria mutica* and 20 acres of Pangola grass *Digitaria decumbens* were planted.

105. *Silage*—A pit was made during October from a mixture of *Axonopus africanus* and Musai Cow pea, for use as a feed supplement in the dry season.

C.—HORTICULTURAL SECTION

106. The policy of the section has continued to be essentially a practical one, the main objective being to stimulate the production of horticultural food crops, and a more definite emphasis was placed on the necessity for planting fruit trees, and economic crops generally, in all parts of the country,

107. The extension work of the section continued, relaying to growers the results of trials carried out on horticultural stations, and assisting them with advice on the selection of varieties, the use of machinery, improved methods of cultivation, and insect and disease control. Soil conservation, by means of terracing, was made an important feature of the advisory work.

108. Staff training continued to be an important function of the work of the section, suitable candidates being selected for further training. Trained personnel were provided for Government Departments, commercial firms and private individuals requiring them.

109. Horticultural development in the Provinces continued, the nursery at Bo being extended. Advisory staff were posted to the Kenema and Bullom areas.

110. The introduction and testing of new varieties of horticultural crops continued, records being kept on the behaviour of these varieties and their performance in different parts of the country. Successful varieties were propagated, and the seeds distributed to progressive and interested growers for testing on their own holdings.

Horticultural chemicals, mainly fertilisers, were subjected to trials, and the results of these tests were relayed to local growers, together with suitable recommendations for their use.

111. *New England Horticultural Station*—Continuing as the administrative headquarters of the Section, this Station also served as a Plant Introduction and Experimental Station, where new kinds of economic and other exotic plants were established and observations made on their adaptation to local conditions. Schools and organisations were encouraged to visit the section, lectures and demonstrations of practical horticultural operations being arranged whenever possible. Terracing to prevent soil erosion was continued, and the irrigation system extended to new areas brought under cultivation. The observation plots of new introductions were continued, and several new species and varieties were successfully established. Of particular interest was the planting of a new block of banana varieties; two of these, "Poyo" and "Gros Michel" were commercial varieties introduced from Guinea. A system of overhead irrigation was installed in the vegetable section; seeds and plants of new varieties were distributed to schools and progressive growers.

112. *Lumley Horticultural Sub-station*—Fruit trees, particularly citrus and mangoes continued to be the main crops raised on this station, and the nursery area was extended by the construction of new terraces. Shade trees were planted on these terraces, and cover crops sown on most of the permanent blocks. The irrigation system was extended. Economic plants were propagated for distribution.

113. *Kabala Horticultural Sub-station*—This station continued to provide planting materials of all kinds for the Northern Province, and an appreciable quantity of fruit trees was made available to the public from the nursery. In addition, the Station continued to operate as an experimental vegetable introduction station, and trials were carried out on new varieties of vegetable. These included fertiliser applications and variety trials, and seeds were produced, on a larger scale than hitherto, for distribution to local market gardeners. The whole of the vegetable section is now on a contour system of planting and this has been found to solve the problem of soil erosion, as well as presenting a practical demonstration of soil conservation. The permanent blocks of fruit trees were also extended, new varieties being established, and this area was also re-designed so that most of the area is now on a contour terraced system.

114. *Njala Nursery*—The re-organisation of this nursery continued, and seedlings of sour orange and mango were planted for subsequent budding. Several other kinds of economic plants were also propagated and shade trees were established on the contour bunds.

115. *Distribution of Planting Material*—The annual distribution of planting materials from the Horticultural Section over the last nine years is given in the following table:—

Year					Economic Plants	Shade trees and Miscellaneous plants
1952	..	..	..	..	796	460
1953	..	..	..	..	1,599	870
1954	..	..	..	..	3,898	1,970
1955	..	..	..	..	4,244	6,760
1956	..	..	..	..	3,547	6,916
1957	..	..	..	..	4,585	7,502
1958	..	..	..	..	3,367	6,504
1959	..	..	..	..	8,651	6,682
1960	..	..	..	..	9,852	11,716

Seedlings of vegetables and annual plants distributed during the year amounted to 6,036 and 8,878 cuttings and seedlings, ornamental shrubs and trees were also supplied. Vegetable seeds were supplied to market gardeners and schools who were unable to obtain these from other sources; the number of packets of seeds distributed during the year amounted to 11,769. Seeds raised on Horticultural Stations provided an appreciable proportion of this total quantity.

116. *Plant Introductions*—During the year 105 new plant introductions were recorded, and of these 35 were successfully established. Of particular interest were plants of "Aceituno" *Simarouba glauca*, established at Kabala, Bo, Lumley and New England. Good growth has been observed and the germination percentage of the seeds imported from San Salvador was 17 per cent. This plant gives a high yield of edible vegetable oil in its natural *habitat*, which is South America.

117. *Vegetables*—Detailed records were kept of the yields of 8 vegetable varieties grown on the Kabala Horticultural Station. These include beans, cabbage, carrot and soya bean varieties. A tomato trial at New England indicated that the variety "Prolific" gave higher yields than either "Open Air" or "Best of All". The "continuous planting" trial with tomatoes at New England gave a percentage wilting of 14 per cent. This was the seventh replanting with tomatoes in bottomless drums, and the percentage wilting was less than the previous trial, which showed about 25 per cent wilted plants. Onion trials at Kabala using NPK fertiliser and combinations of N, P, and K indicated that applications of superphosphate at a rate of 1 ounce/sq. yards stimulated growth and development. The mean diameter of bulbs from one plot to which this treatment was applied was 4.0 inches, and the weight per bulb 2.5 ounces, the number of plants per plot being 20.

118. The number of import permits issued for the importation of plants during the year was 70, and the number of certificates covering the export of plants and seeds was 15, compared with 70 and 26 respectively, for 1959.

119. *Extension Work*—Itinerant staff attached to the various Horticultural Stations continued to give lectures and demonstrations to growers in their areas, also to schools and organisations requesting assistance. Insect and disease control, soil conservation, and the use of fertilisers, were the main subjects on which advice was required. An Instructor was posted to Kenema during the year, since the survey carried out in 1959 had indicated that interest in horticultural work in this area had appreciably increased.

120. *Onion Growing Scheme*—A scheme for the encouragement of onion growing was started during the latter part of the year, and staff on all Horticultural Stations were supplied with seeds for distribution to growers who showed a genuine interest in onion growing. An Instructor was posted to Mahera in connection with the scheme, since a survey had indicated that the growers in this area were likely to be willing to adopt onion growing as a dry season crop. The preliminary results were encouraging, particularly in the Mahera/Bullom, areas, and it is proposed to continue on a larger scale, during the next dry season.

121. *Technical Propaganda*—The distribution of Horticultural Notes continued, and many were re-printed since the demand for them continued particularly from schools. The Vegetable Growers' Guide was published, this is a general booklet, dealing with most of the practical aspects of vegetable cultivation, and embodies most of the information contained in the various Horticultural Notes.

122. *Horticultural Show*—The Ninth Annual Horticultural Show was held at the Freetown Secondary School for Girls, Freetown, on the 14th April 1960, being opened by the Honourable Minister of Natural Resources. The

exhibits produced by growers in the Mountain Districts and Eastern Villages and Schools were of good standard and numbered over 800. Technical exhibits were staged by the Horticultural Section and the Livestock Experimental Station at Newton, as well as by commercial firms and Government Departments. Much public interest was aroused, as was demonstrated by the large number of persons attending the Show.

D—WATER DEVELOPMENT SECTION

123. *General*—Considerable progress was made in the reclamation scheme in the Scarcies area. However due to unfavourable weather and tide conditions the target was not attained. The level survey of Rhombe, by contract, was completed and investigation work, including investigation of the very large Ribbi-Bumpe swamp in the Southern Province was begun.

124. *Funkedeh and Yakban Swamp*—The allocation of the 1,000 acres at Funkedeh was not completed due to disputes over ownership. Only about 50 per cent of the area was cultivated. By the end of the year a total of about 1,300 acres had been reclaimed and improved on the Yakban Swamp, involving the excavation of 68,000 lineal feet of drainage channels. Again, delays due to land disputes prevented the allocation of the new land in the Makot area of the Swamp until the rains and only about 500 acres were cultivated.

125. *Rhombe Swamp*—A level survey of the main swamp area comprising approximately 17,000 acres was undertaken by Messrs. Storey and Partners, a London Survey Firm. The survey is scheduled to be completed by March, 1961, and a plan of the area mentioned at 12" interval with Bench marks and, spot levels shown is to be produced. During the dry season the stick gauges in the area were replaced by automatic water level gauges to measure river levels during the rains and establish a mean sea level datum.

126. *Investigation*—A small experimental polder divided into three separate plots of one acre each was constructed at Wellington. From results obtained, the impression was gained that if these soils were allowed free tidal wash during the dry season, and the sea water excluded during the rains, there would be sufficient time and rain to leach the salt out of the soil and grow a crop of rice in the same season. Towards the end of the year a programme of sodium chloride sampling was commenced for the Little Scarcies river and for the Ribbi and Bumpe rivers in the Southern swamps.

E—EXTENSION WORK

SOUTH-WESTERN CIRCLE (PUJEHUN-BO-MOYAMBA)

127. *Rice*—The swamp at Mandu was re-opened for the production of improved seed rice. Two varieties only were planted namely Faya and Radin China 4. Sixty-one bushels produced in 1959 at Gbuyama were sold to master farmers.

128. *Mechanical Cultivation*—A larger area was ploughed this year for farmers. Payment in full in advance was made by applicants for whom 680½ acres were ploughed and harrowed at the Barbah, Gboyawoma and Njeilonda sites. 611½ acres of the cultivated areas was seed harrowed for farmers at a charge of 10s. per acre. Cultivations commenced on the 11th February at Njeilonda and Gboyawoma and at Barbah on the 15th of February. Work was completed on the 9th and 13th of April, respectively. Six Fowler tractors were used this year, two at each site and very little time was lost due to mechanical faults. A good flood was experienced during the rains and although some damage occurred yields were generally good.

129. 250 acres at the Barbah site were transferred to the Co-operative Department for cultivation in pursuance of the policy of progressive hand over of established areas. The Co-operative Department were able with six tractors to plough 671 acres of which 729 acres were harrowed and 526 acres seed harrowed.

130. *Cocoa*—The distribution of cocoa seedlings in the Moyamba District was stopped as that area is not suitable for the crop. Amazonian cocoa varieties are now recommended by the Department and for this reason the distribution of Amelonado cocoa was curtailed in Bo and Pujehun Districts. Amelonado cocoa will no longer be grown in the nurseries and stocks of Amazonian are being increased. Distribution figures for each District are shown in the table:—

	1958	1959	Amelonado 1960	Amazonian 1960
Pujehun	1,151	3,423	900	1,840
Bo	850	2,693	1,250	1,280
Moyamba	9,729	1,745	Nil	Nil

Seedling stocks in nurseries at the end of the year were as follows:

Pujehun District ..	12,087	Amazonian Pujehun	3,748	Amazonian Zimmi
Bo District	7,466	Amelonado ..	854	Amazonian

Planting of seedlings distributed was supervised and only farmers with land suitable for cocoa were supplied.

131. Monkey damage continued to be a major nuisance and 22,959 monkeys were killed in organised drives. The cocoa yield was good this year and little damage by capsid or Black Pod disease was seen.

132. *Amazonian Cocoa Plantation—Futa*—622 pods were harvested from the plantation and distributed between the Jimmi Bagbo, Zimmi and Pujehun nurseries. Fifty-five pods were sold at 1s. each to selected farmers. The pods harvested were of the following varieties:—

Variety	Futa Harvest Yield/pods	No. of Trees
T6/1775 x 1051	228	28
T85/799 x 876	170	14
T12/27 x 26	224	17

Borer attack killed three trees in the plantation and to prevent further deaths Aldrin was sprayed on all trees. 210 pods of Amazonian cocoa *ex* Ghana were received from which 6,214 seedlings were raised in the Pujehun nursery.

133. *Coffee*—During the past four years the following distribution of coffee seedlings has been made from nurseries:—

Seedling Coffee distribution					Stock at
	1957	1958	1959	1960	31/12/60
Pujehun	—	—	1,865	—	3,986
Bo	5,619	3,328	20,142	24,889	41,613
Moyamba	87,541	139,000	62,923	11,890	—
Total	93,160	143,228	84,930	36,779	45,599

Particular attention is being paid to plantation management by extension staff but many farmers continue to neglect their coffee. The coffee harvest was below average due to the long period of drought in the dry season followed by very heavy rainfall in the wet season. Stem borer *Bixadus sierricola* continued to be a serious pest.

134. *Oil Palms*—Interest in improved oil palms continued to be high. The following distributions of seedlings have been made to farmers in the past four years:—

		1957	1958	1959	1960	<i>Stock in Nurseries</i> 31/12/60
Pujehun ..		5,540	—	1,910	5,575	2,569
Bo ..		13,059	7,726	10,692	2,118	19,727
Moyamba ..		1,552	835	10,360	777	—

In addition during the year 20,000 extension work seeds from the West African Institute for Oil Palm Research were issued as germinated seed to the Bo District nurseries and 10,000 to Pujehun District.

135. *Oil Palm Development Projects*—Field work continued at Sahn and Kasse where 1,000 acre oil palm plantations are being established. 90,912 germinated seeds were placed in raised trays in pre-nurseries. After transplanting from the trays to the nursery the following seedlings had survived at 31st December, 1960:—

		<i>T x D</i>	<i>D x P</i>	<i>Deli x Pand</i> <i>D x P</i>	<i>T x D</i> <i>Mixed</i>	<i>Total</i>
Kasse ..		21,204	13,943	565	48	35,766
Sahn ..		12,383	9,183	—	—	21,586
Total ..		33,587	23,126	565	48	57,352

These 57,352 seedlings will be available for planting in 1961, and should be sufficient for 900 acres.

136. A further 49,402 germinated seeds were placed in germination beds in November and will be available for 1962 plantings.

				<i>D x P 1st</i> <i>grade</i>	<i>D x P 2nd and</i> <i>3rd grades</i>	<i>Total</i>
Kasse ..	..	..	..	2,534	26,464	28,986
Sahn ..	..	..	..	1,598	18,806	20,404
Total ..	..	..	..	4,132	45,270	49,402

137. The clearing and planting done in 1960 was as follows:—

<i>Plantation 1960 Area</i>				<i>1961 Area</i>		
				<i>Brushed/ Acres</i>	<i>Planted/ Acres</i>	<i>Brushed/ Acres</i>
Kasse ..	..	..	..	100	100	380
Sahn ..	..	..	..	200	153½	259
				300	253½	639

All palms were mulched and fertilised after planting. Ring-weeding and brushing were done as required. Clearing for the 1961 plantation area was started and progress made by the end of the year is shown in the table.

138. *Bo District Council Plantation, Gbaama* The good condition of the existing 44 acres was maintained and the palms planted in 1956 came into bearing. A further 30 acres was cleared and planted and at the end of the year no failures were discovered.

139. *Rubber*—The rubber plot at Gofor was maintained and pueraria planted as a soil cover. A further plot of one acre was planted at Nguabu, Moyamba District in June. A nursery of 1,068 seedlings was established at Twasu near Gofor.

140. *Livestock*—The demand for pigs and poultry continued particularly in the Bo area and several farmers are making a success of livestock enterprises.

NORTH-WESTERN CIRCLE (PORT LOKO-SCARCIES)

141. *General*—Intensification of extension work with propaganda on aspects of agricultural development including oil palm and poultry was carried out. Advice continued to be given to District Councils on the establishment of oil palm plantations and in the upkeep of oil palm nurseries. A general consolidation of mechanical cultivation work both on the substation at Katonga and in the area generally was maintained.

142. *Mechanical Cultivation*—There was an increase in the acreage ploughed from 243 acres in 1959 to 595 acres in 1960, with a slight reduction in the cost per acre on the previous year's figures. Difficulties were again experienced in both land and river transport of tractors and implements. Ploughing fees collection continued, reducing the outstanding fees very considerably.

143. *Development of Lophira Bush—Oil Palm*—There was a step up of interest in the distribution of seedlings: an increase from 5,807 seedlings distributed in 1959 to 12,150 in 1960 was achieved from District Councils nurseries. Maintenance of plots at Malal and Katonga continued, and a 30-acre plot was established at Konta in Kambia District for the District Council. It was still not possible to hand over the Katonga plantation to local farmers as a suitable farmer could not be found. Growth of the palms continued to be satisfactory.

144. *Livestock*—Interest continued to be shown in poultry and a total of 150 pairs of chicks was sold to farmers.

145. *Mangrove Clearance*—High yields were obtained from the Luti and Rosino swamps. Trial ploughing and harrowing of 51 acres on the Funkadeh swamp was carried out, and good yields were obtained.

SOUTH-EASTERN CIRCLE (KENEMA-KAILAHUN-KONO)

146. *General*—Staff was variously distributed to general duties with Kenema and Kailahun Districts, to the Kono development plan, to the Cocoa Virus Survey, to the Cocoa and Coffee Development Station at Kpaubu, to the opening of the new Experimental Station at Pendembu and to the cocoa Black Pod spraying campaign.

147. *Rice*—Although rice farming on the uplands continues on an extensive scale there appears to be a steady increase in the acreage of swamps farmed in the Circle. Radin China 4, and Faya, were the varieties grown for seed production during the year. The pure seed was obtained from Rokupr and the crop was rogued before harvesting. 1,860 lbs. of Faya and 12,268 lb. of Radin China were available at the end of the year for distribution to Master Farmers as stage 3 of the Improved Seed Rice Multiplication Scheme. The use of phosphate fertiliser was encouraged but sales were disappointing.

148. *Oil Palms*—Production of oil for consumption and sale, with consequent production of kernels, continues on an extensive scale, but the wild crop is still not fully utilized, especially in the diamond areas. Oil palms are nevertheless, an important cash crop, and the Co-operative Department is planning to build special stores for palm kernels in the Eastern Province.

3,224 seedlings were distributed to farmers from District Council nurseries. Wire collars supplied free by the Produce Marketing Board were issued with the seedlings. The percentage survival after planting is still low, and poor nursery practice is mainly to blame for this. Other contributing factors are delays between lifting from the nursery and planting, and lack of maintenance by the farmer.

149. *Coffee*—The policy has been to encourage better maintenance of existing farms rather than extensive new planting. Yields could undoubtedly be increased if maintenance was improved. Most farmers have shown reluctance to brush their farms more frequently and to adopt three stem pruning. There has been considerable improvement in the quality of clean coffee sold, but further improvement is possible. One buyer from the Continent is said to be using coffee sold by the Co-operative Department as a standard.

150. The 1959/60 crop was somewhat better than the 1958/59 crop. The January to December, 1960 export tonnage was 5,098 tons compared with 4,932 tons for the same period in 1959.

151. Nuisance ants (mainly *Occophylla* sp.) on coffee were successfully controlled with Gammalin 20 in trials conducted in the Kenema area by the Entomologist. *Bixadus sierricola* White, and *Xylocorus* sp. are widespread pests for which no effective treatment can at present be recommended.

152. *Cocoa*—Interest in cocoa was maintained, and planting usually, seed at stake, continued on a large scale. No co-operative planting loans were issued during the year. Extension staff assisted with selecting sites, lining out farms, and with pest and disease control measures.

153. From the table of buying figures below it will be seen that the 1960 crop was better than the 1959 crop, and this in spite of Black Pod disease being more severe than usual.

Buying Centre						Sept. 1959/ May, 1960	Sept. 1960/ May, 1961
Blama	..	..	..	..	..	1,989	3,114
Kenema	..	..	..	..	..	10,321	10,122
Hangha	..	..	..	..	..	5,203	5,535
Segbwema	..	..	..	..	..	12,371	11,964
Daru	..	..	..	..	..	5,223	5,206
Baiima	..	..	..	..	..	3,537	4,580
Pendembu	..	..	..	..	..	9,248	8,430
Kailahun	..	..	..	..	..	4,719	5,750
Total	..	..	..	..	..	52,611	54,701

Over 99 percent of the cocoa purchased was Grade I.

154. 1,486 F 3 seedlings of the Amazon varieties were distributed to selected farmers. Very great interest was shown in this new variety which is now much in demand.

155. 1,000 F 3 pods of the Amazon variety were imported from Ghana in December, and nurseries were opened by the Department at Kfuwabu, Kenema, Segbwema, Manowa, Kailahun and Wordu, and 200 pods were sent to South-western Circle. Germination was poor in all nurseries.

156. Spraying cocoa with Carbide Bordeaux mixture against Black Pod disease continued on an extended scale. Some 53 hand operated knapsack sprayers owned by the Co-operative Societies were in use during the season. Very few farmers kept to the recommended three-weekly application, but even so they were satisfied with the results, and a number now wish to buy machines of their own. Leaflets on Black Pod spraying were printed and distributed to farmers.

157. *Capsids*—Trials on control of capsids were conducted at Balahun, Guabu, Gegbwema, Neikabu, Konabu, Tisor, and Foya by the Entomologist.

158. *Monkey Drives*—Monkey drives were held in Kenema and Kailahun Districts and bonus payments of 1s. 6d. per head were made for some 16,789 monkeys killed. Leaflets on monkey drives were printed in English and Mende and distributed.

159. *Mining Areas Development*—A site for a new substation was selected at Wordu 3 miles south of Koidu. No suitable site nearer Koidu could be found. Construction of an office and a store was completed and terracing of the slopes was begun. A seed and fertilizer store was constructed at Waiima. The capital cost of these projects was borne by the Mining Areas Development Authority.

160. *Senehun and Worordu Oil Palm Plantations*—Supervision of these on behalf of the Kono District Council continued. Attempts to find tenants to take over these plantations have so far been unsuccessful.

161. *Rubber*—The growth of the trees in the 1 acre trial plot of rubber, variety Tjir 1 x 16, planted in 1959 is satisfactory, most of them being about 10 feet in height, though some crowns are now showing a tendency to bend over.

162. *Cocoa Coffee development Station—Kpuabu*—This was established in 1957 under Colonial Development and Welfare Scheme D 3055. The area of the station is 165 acres and there are two distinct soil types, a terrace soil predominantly laterite gravel and an alluvial soil along the flood plain of the Keyi stream. With the completion of the insectory, drying floor and the installation of a water supply, the main construction phase in the establishment of the station, is now concluded.

163. A further 9 acres of F 2 Amazon cocoa was planted on the station for multiplication purposes during the year. 1,480 seedlings of F 2 and F 4 Amazon Variety were distributed to farmers. Pod production from the Amazon trees on the station reached 120 compared with a production of 20 pods the previous year.

164. Seed of Series I and II W.A.C.R.I. hand pollinated varieties was imported for variety trials, and together with Amelonado for experiments and Amazon F 2 and F 4 for distribution, there were more than 23,000 seedlings in the nursery at the end of the year.

165. The following nursery trials were started—

- (i) To study rate of root development of nursery seedlings.
- (ii) To compare effect on seedling growth of different sizes of pot.
- (iii) To find optimum rate of watering for seedlings in the dry season.
- (iv) To compare rate of growth of potted seedlings grown on raised platforms with potted seedlings grown on the ground.
- (v) To investigate further an apparent stimulus to growth obtained from transplanting seedlings at an early stage.
- (vi) To compare growth of seedlings in 3 different types of pots

166. Field experiments were as follows:—

- (i) An experiment designed to investigate the effect of transporting and transplanting bare root seedlings was laid down in Block 45, and repeated in Block 125.
- (ii) Recording continued on the variety trials Kpuwabu reference 107 June, 1959, 135 140, 1959, and 40 41, 1959. There have been a large number of deaths in trial on Blocks 40 41, not all of which can be attributed to the poor soil.

- (iii) The cocoa time of planting trials reference 97, 1959 and 107. 1959 have given inconclusive results. It appears that other factors such as slight variation of soil or shade far outweigh any effect of planting between June and August. The seedlings with bare roots in this trial suffered a slight set back at transplanting compared with those planted from baskets, with soil intact, but this check produced no measurable results at 6 months after planting.

Pre-treatment yield recording of the cocoa farms at Neikabu and Kpai continued and fertilizer application will be made in 1961.

167. Yield recording of the farmers' coffee on the station continued. 8 acres of Robusta coffee was planted for selection purposes. The mother seed was from selected high yielding trees from Njala or from farmers selected trees. Some 5,595 seedlings remained in the nursery for planting out in 1961.

168. A plot of 63 seedlings of *Coffee stenophylla* was planted for observation and selection. Ten varieties of Robusta coffee were sent from the Federal Research Station Nigeria. Both rooted and unrooted cuttings were received and 43 of the 48 sent are surviving.

169. *Cocoa and Coffee Research Station—Pendembu*—Funds were made available in 1960 under Colonial Development and Welfare Scheme D 4246 and R 1151. A site, just east of Pendembu, the railhead in Kailahun District was selected and work on clearing roads and building sites commenced.

170. *Cocoa Virus Survey*—The preliminary survey started in 1959, and covering some 3,840,000 acres was completed in June. The object of the survey was to correct maps, locate cocoa farms, and carry out a somewhat biased sample survey of cocoa trees to assess the incidence and distribution of virus diseases. As a result the following suspected virus outbreaks were found:

Wunde—176

Gandorhun—16

Giehun—14

171. On re-inspection the symptoms at some sites had disappeared and confirmation was not always possible. Gandorhun and Giehun symptoms have been transmitted under experimental condition at W.A.C.R.I. and Njala. Attempts to transmit the Wunde symptoms have failed and these can no longer be regarded as those of virus.

172. On completion of the preliminary survey staff were trained for a more intensive survey, having as its objective the inspection for virus symptoms of every cocoa tree in the main cocoa growing area of the country. Information on acreage, age and condition of trees, incidence of Capsid damage, and Black Pod disease and coffee acreage is also being collected.

173. At the end of the year some 23,881 acres of country containing some 801 acres of cocoa and 2,155 acres of coffee had been covered. Within this area occurred 1 site showing the Gandorhun symptoms, 2 sites showing the Giehun symptoms, and 20 showing Wunde symptoms. An interesting point is that 37.8 per cent of the cocoa recorded is under 7 years of age.

SOUTHERN CIRCLE (BONTHE)

174. *Mangrove Swamps*—No new clearings were done in the year. A further 158 acres of cleared land were allocated to farmers in the Mandu Bendu and Shenge Island areas. The Torlo site remained uncultivated. Heavy loss of crop was sustained in the Mandu area due to fish, monkey and flood damage.

175. *Rice Experiments*.—The West African Rice Research Station staff carried out experiments to test fertilizers, organic matter and varieties on deeply flooded land at Torma II Site. Trials by the Department were laid down at Makita, Mayeke and Gondama sites and in addition yield observation plots were planted.

(a) Variety trials at Makita and Mayeke sites were continued as a continuation of the 1959 trials with the inclusion of Bong Sen Den and Parn A 191 which had shown promise in the 1959 observation trials. The results are summarised below:—

Variety	Makita Site		Mayeke Site	
	Yield Paddy per Acre in lb.			
	1959	1960	1959	1960
Radin China 4 ..	1,470	493	2,305	615
Mereke ..	1,135	453	2,630	590
Seri Raja ..	915	101	1,650	443
Mbagboli ..	735	—	2,005	967
Pia Gazo ..	1,170	—	1,200	171
Bong Sen Den ..	—	—	—	237
Anak Didek ..	995	514	2,350	363
Parn A 191 ..	—	646	—	141

The 1960 results were disappointing and are attributable to weed competition and bird damage which could not be controlled owing to lack of funds. The Makita site is not cultivated for farmers as fertility has declined steadily.

(b) A crop rotation trial was laid down on Makita site to obtain preliminary information which might lead to the devising of a rotation for the higher banks of the Sewa. Four replications of blocks containing Radin China 4, pigeon peas, pueraria, cowpeas and fallow plots were laid down. A poor yield of rice was obtained but the other crops failed. The site was flooded for two months and there was strong weed competition.

(c) Fertilizer responses were tested at Mayeke and Makita to increasing levels of phosphate in a randomised block layout using Mbagboli *ex* Rokupr. At Makita the rice did not yield, presumably due to excessive weed growth and it appeared that weed growth was enhanced at the expense of the rice crop. At this site also a trial to assess residual effects of the 1959 phosphate response trial failed due to weed growth. Results at Mayeke were as follows:—

Treatment	Yield Paddy lb. per Acre			
No fertiliser ..	..	..	..	1,950
$\frac{1}{2}$ cwt. Superphosphate per acre ..	..	..	..	1,760
1 cwt. Superphosphate per acre ..	..	..	..	1,462
$1\frac{1}{2}$ cwt. Superphosphate per acre ..	..	..	..	1,433

This confirms previous results showing that on sites where deep flooding occurs there is no response to fertilizers.

(d) Observation plots of 16 promising varieties from Rokupr were laid down. Bamako and Nachin II will be used in variety trials next year.

176. *Mechanical Cultivation*.—Operations started in the last week of January and ended in the third week of May. Conditions for work were good and rapid progress was made. Twenty-eight tractors comprising 20 Fowlers, 4 old-type Fordson counties, 1 track Marshall, 1 International B.T. 6 and 2 Caterpillar D 4—carried out the operations. The International with wide tracks proved very useful in the wet areas of the lower Sewa where in 1959 Fowler tractors bogged down repeatedly. The Caterpillars worked with two Ransome ploughs in tandem.

177. Seven hundred and thirty-four acres were ploughed for the Co-operative Department on the Torma I and II, Yawbeko and Loponga sites. The Co-operative Department also guaranteed the payment of ploughing fees for 3,958 acres and farmers paid for 1,546 acres. It was possible for the Department of Agriculture to plough and allocate to farmers a total of 5,508 acres.

178. The progress of the scheme since 1949 is shown in the following table:—

Year	Acreages Cultivated—Bonthe Circle											
	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Ploughed ..	4	70	282	470	1,165	2,278	4,073	5,530	5,302	4,115	3,788	5,508
Allocated ..	4	70	250	466	1,165	2,044	4,059	5,530	5,302	4,115	3,788	5,508
Seed Harrowed —	—	—	—	—	—	—	—	—	1,293	2,231	2,301	3,295

It will be seen from these figures that the decrease in acreage ploughed, following the introduction of payment in advance in part in 1958, and in full in 1959, has been arrested and the 1959 level has been re-attained. A new record for the acreage seed harrowed, and additional service for farmers to assist them to plant early, was reached.

179. A total revenue of £18,017 10s. 0d. was earned from the year's operations.

180. Generally the growing season was good in all areas. Farmers planted early and rice crops got away to a good start before the onset of the floods in late July and although the depth and duration of the floods was greater than in 1959 there was little flood damage. On Kiban and Taigbe sites farmers introduced a variety known as Kalinee which cannot tolerate submergence for a long time and this variety was completely destroyed. The paddy bug *Scotinophora* sp. and a rice borer were reported as causing some damage in the upper Sewa sites and in this area weed growth limited yields on the high banks. Yields were good on all sites and were acclaimed as the best ever in the Waanje area.

181. Farmers sales of rice through the Co-operative Societies in Bonthe District totalled 76,902 bushels sold to the rice mill at Torma at 19s. per bushel for the 1960/61 crop.

182. *District Council Work*—The assigned Agricultural Instructor supervised the mangrove clearance project and the oil palm plantation at Gambia.

NORTHERN CIRCLE (BOMBALI-TONKOLILI)

183. *General*—The accent of work in this Circle continued to be on the provision of advisory services to farmers and on contract mechanical cultivation. More stress was given than in recent years to oil palm and coffee production and District Council nurseries were reorganised.

184. *Ox Ploughing*—Demonstrations were undertaken in the neighbourhood of Kamakwie in Sella Limba and Sanda Lokko chiefdoms, as a result four ploughs were purchased and arrangements made for training farmer's oxen at Kamakwie. An open shed and yard is being constructed. The scheme is proving popular and it is hoped that it will continue until the benefits are fully appreciated by farmers.

185. *Mechanical Cultivation*—An increase in acreage cultivated was recorded as farmers became more used to the idea of paying in advance. In addition the rice grown on the ploughed areas was better cared for than in the past. Requests for threshing by the Department were received. Several Co-operative societies were formed for the purpose of marketing rice. Old debts remained high and little was recovered during the year.

186. The acreage worked since the inception of the scheme is shown in the table below:—

1952	1953	1954	1955	1956	1957	1958	1959	1960
238	915	2,449	3,600.75	2,819.5	2,625	1,514	415	926

Sales of fertilizers continued to increase.

187. *Rice Investigations—Kontobe*—Rice experimental work at Kontobe was continued. Flood water levels were however exceptionally low and damage by deer to some plots was extensive; no significant results were obtainable from two plots.

1/60 and 2/60 *Fertilizer trials* repeat of 6/59 and 7/59 to investigate the effect of organic matter, lime, phosphate and iron rich soil on boli rice. Both plots were severely damaged by deer and no significant results were obtained. 3/60 and 4/60 *Residual effect trials*. Organic matter applied in 4/60 did not influence yield. Yield differences due to gradation in water depth were observed, with the higher yields at the deeper end of the plots. 5/60 *Fertilizer trial*. Nitrogen compared with phosphate with or without lime, was found to depress yields at all levels and in all combinations. 6/60 *Transplanting compared with broadcasting and methods of applying Nitrogen*. Transplanting gave higher yields, as did nitrogen applied prior to transplanting. Applied as a top dressing it depressed yields.

7/60 *Water Control Experiment*. West African Rice Research Station plots.

8/60 *Subtractive Experiment*. West African Rice Research Station plots. Nitrogen applied by normal method depressed yields, as did the absence of phosphate, lime, iron and organic matter, singly or in combination.

9/60 *Variety Trial*. West African Rice Research Station plots. Bucket trials carried out at West African Rice Research Station Rokupr with Kontobe soils showed:

- (a) Severe phosphate deficiency
- (b) Severe nitrogen deficiency
- (c) Possible organic matter deficiency.

188. *Semi Boliland and Upland Investigations—Kontobe*—Farming system trials were devised in an attempt to find a crop rotation for semi-bolilands by integrating cattle and crops. Preliminary results indicate that crop yields are low and insufficient to do more than augment the usual feed for the cattle during the dry season. Groundnuts, millet and sorghum were tried; the groundnuts gave an average to poor yield, the others failed. Jute was also tried at Kontobe and Makeni with limited success.

Oil palm and coffee seedlings were distributed from District Council nurseries. 7,595 oil palm and 5,899 coffee seedlings were supplied to farmers

NORTH-EASTERN CIRCLE (KONINADUGU DISTRICT)

189. *Cattle Owner Settlement Scheme*—This was a year of further consolidation. In a year when there was a large increase in the acreage of rice and groundnuts planted by the landowning tribes the scheme maintained its popularity in Mongo Chieftdom, where the Kurankos had hitherto been somewhat reticent.

190. The following table indicates the development of the scheme:

	1953	1954	1955	1956	1957	1958	1959	1960
No. Registered ..	17	36	37	44	63	110	110	109
No. Occupied ..	14	14	33	29	57	86	89	86

191. The Cattle Owners Co-operative Society at Kabala did little business during the year and lack of reasonable cattle marketing facilities is hampering progress.

192. Planting of improved grasses and clearing of heavy bush continued. 7,500 yards of barbed wire fence were erected by voluntary and direct labour the wire and staples being purchased through the revolving fund. Settlers also purchased gammatox, tools and veterinary medicines through this fund at cost price.

193. Organised visits by cattle owners to the Animal Husbandry Station proved popular.

194. *Mechanical Cultivation*—Interest was maintained and the acreage cultivated for farmers increased.

			1957	1958	1959	1960
Ploughed	..	..	140	215	319	594
Harrowed	..	..	38	81	104	237

Tractors attached to the Settlement Scheme were also used on a contract basis for haulage for District Councils and private individuals.

195. *Kabala Substation*—This was re-opened and used for rice multiplication. 4,000 E.W.S. oil palm seedlings and 1,000 coconuts were nursed.

196. *Ox-ploughing*—Little progress has been made recently but some interest became apparent towards the end of the year.

197. *District Council*—Work was limited to the Settlement Scheme and to the running of Native Administration nurseries.

COLONY CIRCLE (NEWTON)

198. *Rice Swamp Development*—Rainfall was erratic and well below the 10-year average. In the first quarter it was slightly above average for the season but fell by 7"—8" and 5" in the 2nd-3rd and 4th quarters, respectively. As usual those farmers who planted late were the ones who suffered most owing to the falling off of the rains at the end of the growth period. Satisfactory crops were however obtained where early planting had been practised.

199. There was a further drop in the acreage rented to farmers in the Maswari Area—dropping from 69½ to 44 acres. The area mechanically cultivated showed a marked improvement—rising from 15½ acres to 50 acres—the second highest total in the area. An increase is also recorded at Fogbo—the acreage increased from 5½ to 14. Land pressure continues to make Welling-ton polder the most popular area in the Colony—the total workable area of 59 acres was taken up. Some badly needed work was done on the bunds and they are now in a good state of repair.

200. In general swamp rice cultivation was disappointing from the point of view of acreage—especially in the areas remote from Freetown.

201. *Oil Palm Distribution*—Oil Palm distribution which was severely curtailed in 1959 because farmers did not prepare their land properly showed a marked improvement. Approximately 6,000 seedlings were supplied as against 1,250 in 1959. Wire collars were again supplied free during the year.

202. *Coffee Distribution*—Coffee growing at Newton was in the past financed from Rural Area Council funds. The coffee nursery was therefore closed down when funds were no longer available to maintain it. No seedlings were distributed but all requests were met by the Horticulturist, Freetown.

203. *Local Stock Keeping*—The pig keeping industry continued to expand and 206 animals were sold to farmers. Farmers showed increased appreciation of the value of better housing and proper feeding for their stock, although the latter is sometimes below standard. Demand for weaners continued to exceed supply.

204. *Poultry keeping* made particularly rapid strides and a total of 7,700 chicks were sold of which 3,264 were day olds. Demand continued to far exceed supply but during the year the new hatchery was almost completed and will (it is hoped) be in action by mid 1961.

205. It is of interest to record that a producers association called "The Pig and Poultry Association" was formed in Freetown. Members are drawn from the bigger producers in the Colony area. The aim of the association is to improve the lot of producers in general and to centralise their marketing facilities.

206. *Waterloo Oil Palm Plantation*—With the completion of planting in 1959 the main operations during the year were stumping and brushing. A good deal of the work was carried out with the Fowler tractor and Bray dozer. Where possible all areas were mechanically brushed several times with the Caldwell bush-cutter. The latter machine has proved very satisfactory when used on stumped areas. A total of 329 acres has now been cleared. Records of weight of fruit harvested were continued and this year there was an increased bunch weight from 130,015 lb. to 214,199 lb.

The 1957 and 1958 areas had started fruiting by the end of the year. All of the fruit was sold locally.

F—RESEARCH

PLANT PATHOLOGY SECTION

207. The Plant Pathologist was on vacation leave from June to mid-October and soon after his return he resigned leaving the service in November.

208. *Collections*—Fungi from banana leaves identified at the Commonwealth Mycological Institute include the following:

Piricularia sp. New to C.M.I.

Ramichloridium musae. Stahel; new to Africa.

Zygosporium minus. Hughes; new to Sierra Leone

Glimastix sp., new to C.M.I.

209. *Virus disease of Cocoa*. Numerous successful grafts were made with "Wunde" and "Giehun" virus material but without transmission of any virus symptoms. The "Wunde" symptoms are almost certainly not attributable to a virus.

210. *Black Pod Disease of Cocoa*—*Phytophthora palmivora* (Butler)—In the absence of the Plant Pathologist on leave no further experiments were carried out. Yield records of experimental plots at Kpuabu were however kept and pre-treatment yield recording was commenced at Gotobu where there is a high level of incidence. This area will be used for future trials.

211. The Plant Pathologist organised spraying courses for the spraying machine operators of the Co-operative Societies, but the scheme was thereafter supervised by the field staff of Kenema Circle.

212. *Tobacco Disease*—A wilt disease was reported on tobacco plots of the Aureol Tobacco Company at Makeni. Eelworms and *Fusarium solani* were isolated from diseased material. This was followed by a simple replicated experiment to determine the pathogen. Healthy seedlings were grown in

sterilised soil which was inoculated with the fungus and eelworm isolates separately and together. Wilt was only apparent in the case of plants inoculated with eelworms and *Fusarium solani*. The eelworm was identified at Rothamstead as *Meloidogyne incognita*.

SYSTEMATIC BOTANY SECTION

213. The newly appointed Systematic Botanist and Ecologist Dr. T. S. Bakshi, arrived in Sierra Leone on January 16th, 1960. For several years the post of Botanist had been vacant and initially therefore he was fully occupied training Laboratory staff and organising the section.

214. *Boliland Vegetation Survey*—The vegetation survey of the bolilands was started in February. The following three associations have so far been recognised for this area:

- (a) *Anadelphia leptocoma*/*Rhytachne rottboellioides*
- (b) *Chasmopodium caudatum*/*Nauclea latifolia*
- (c) *Lophira lanceolata*/*Chasmopodium caudatum*

Their relationships to the original climaxes are still undecided primarily because of the almost complete absence of relatively undisturbed areas the search for which still continues. The exact and total species composition of the above associations is under investigation.

215. *Forest Studies*—Numerous specimens have been collected from the Kambui and Gola Forests. Extensive collections of the so-called *Parinari excelsa* have been made, and it appears that it may comprise two species the differentiating characters of which are now being studied in detail. The Divisional Forest Officer, Kenema has recently noted a species of *Daniellia* whose characters do not match with any *Daniellia* species described in the Flora of West Tropical Africa. The flowers of the plant have been collected for examination.

216. *Banana Variety Survey*—The local varieties of bananas have been surveyed in the following chiefdoms:

District		Chiefdom	
Bonthe		Bum, Nongoba	Bullom
Pujehun		Makpele,	Sorogbwema
Bo ..		Bumpe	
Moyamba		Kowa, Dasse	
Kenema		Gaura, Dama, Nongowa,	(partly), Bambara (partly).
Koinadugu		Mongo (partly).	
Bombali		Bombali Seboria	(partly).

The following six varieties have so far been recorded: Manawa, Jimingae, Mende Hedde, Mamonga, Red Mamonga and Dongodbo-se. Of these the first four are green bananas and the last two red. Detailed differentiating characters of these varieties have been noted, and an attempt has been made to find something about their polyploidy by using the scoring system suggested by N. W. Simmonds. This will have to be corroborated by studying the chromosome number of each variety. It is hoped to complete the banana survey in the Mende areas during the next few months after which the study of Temne areas will begin.

217. *Other Investigations*—Preliminary work was begun on the species compositions of grazed and ungrazed sites in the cattle owner Settlement in Koinadugu District. Collections were made of weed species occurring on the Sewa riverain grass-fields. Other works carried out in Bonthe District included the commencement of a study of the ecology of *Vossia cuspidata*, the sud-grass of the southern waterways and experiments to control this using herbicides

have been planned. A study will also be made of the climatic and fire climaxes of the Turners Peninsula. A survey was made of the vegetation of the rubber plantation site at Sorogbwema.

218. *Herbarium and Collections*—The names of all the herbarium collections falling under Vol. I of the Flora of West Tropical Africa were revised and a thorough revision of the ferns and fern allies was also made. Over 400 collections were made during the year and of these 304 were sent to Kew. At least six species appear to be either new records or new taxa.

ENTOMOLOGY SECTION

219. The Entomologist, Mr. M. F. Rushton, was in post throughout the year. He visited Ghana 1-16th March to study capsid control and swollen shoot transmission techniques.

220. *Cocoa Pests—Capsids*—During the first half of the year a series of trials were carried out to find out an insecticidal treatment to control the cocoa capsid *Sahlbergella singularis* Hagl. Three insecticides were used, Aldrin 40 E.C., Gammalin 20 E.C. and Endrin 20 E.C. applied at one, two and three-month intervals at 4 oz. toxicant per acre in 5 gallons of water. Initially Mysto W/SS/2 hand operated machines were used but these were replaced by a motor driven mist-blower, the 'Motoblo', being the machine chosen. It was found out that all treatments involving an interval of more than a month between applications were ineffective and that Endrin did not give appreciably better control.

221. A new series of trials was laid down in October, the ineffective treatments being abandoned and Endrin discarded in view of its high toxicity. These trials are designed to determine the comparative effectiveness, of Gammalin and Aldrin and of the 'Motoblo' and 'Mysto' and to compare the effect of the following spraying time intervals:—

- (1) double application at one month interval before and after the rains
- (2) double applications as above with a double application in January; February;
- (3) regular monthly spraying.

222. Capsid population studies are being made also in order to determine the peak periods, as control measures will be more effective if related to the fluctuations in population.

223. *Stem Borers—Tragocephala* sp. have been noticed attacking occasional branches. At Njala large numbers of adults have been found feeding on the soft green bark of *Salacia* sp. and *Hippocratea* sp. Other Cerambycid borers recorded on cocoa include *Cereoposis buettneri* Kibe, *Glenea giraffa* Dalm., *Monochamus ruspator* F. and *Frea curta* Chevr.

224. The Scolytid borers *Xyleborus* sp. attack seedling cocoa and at Kpuabu 4 per cent of the seedlings were damaged. Some of these were pruned back, below the bore holes and have since recovered.

225. *Coffee Pests—Xyleborus morstatti* Hag. A trial was laid down at Njala in May on Block 12 using various insecticides in an attempt to find a control of this pest on robusta coffee. Plot size was 12 trees with four replications of five treatments. The insecticide was applied at 1 per cent active ingredient; the five treatments were:—

- (1) Dieldrin E.C. 20
- (2) Dieldrin E.C. 20—Tenac
- (3) Endrin E.C. 20
- (4) W.L. 1650 E.C. 15
- (5) Control

Two applications were made on May 6th and June 3rd. The total numbers of boreholes and of dead twigs per plot were recorded at 4-weekly intervals. There was no significant difference between treatments. It was found however that *Xyleborus* damage was not the main cause of twig death as the total number of bore holes was much less than the number of dead twigs. Although a single guard row was provided around each plot it was found that plots near the main pathway were more heavily attacked than those near the roadway.

226. The coffee stem borer *Bixadus sierricola* White: is the most serious coffee pest and trials were started at Njala to control it using 0.5 per cent Dieldrin emulsion applied by brush to the lower five feet of the stems. Half of the trees in Block 25 were treated.

227. Nuisance ants which nest on the coffee trees and make harvesting a painful process were readily controlled using 0.5 per cent Gammalin. There are three kinds of ants involved, "Dolei" a large red ant of the genus *Oecophylla* "Falui" a small black ant which builds mud nests and "Ngevalui" a small red ant. Trials showed that "Dolei" can be readily controlled with 0.25 per cent Gammalin if the nests of woven leaves are first broken open and of the "Falui" if the mud nests are soaked with a jet of Gammalin.

228. A lepidopterous caterpillar was found attacking coffee suckers at Njala. This was identified as *Duomitis armstrongi* Hmps. (Cossidae).

229. *Tsetse flies*—A large number of tsetse flies were collected at Teko and Newton. *Glossina palpalis* Robineau—Desvoidy was the only species found; many of the insects were dissected but none were found to contain trypanosomes although trypanosomiasis occasionally affects the pigs at both stations. Flies were caught by collectors at the rate of .7 per hour at Teko and .5 per hour at Newton. At a private piggery near Newton tsetse flies were caught at the rate of 11.3 per hour; the low population of these insects at Newton and Teko is probably a reflection of the effect of bush clearance and routine insecticidal spraying of the piggeries.

230. *Liver fluke at Musaia*—An investigation into the secondary host of liver fluke *Fasciola gigantica* was carried out during the dry season. *Bulinus africanus* does not occur but a related fresh water snail *B. globosus* was collected. *Lymonea Natalensis* was not discovered and it is possible that this species aestivates during the dry period. It is necessary now therefore to determine whether *L. Natalensis* occurs during the wet season or whether another species is acting as secondary host.

231. *General*—Valuable discussions were had with Dr. F. J. Simmonds of the Commonwealth Institute of Biological Control during his tour of Sierra Leone.

Reports of three locust swarms were received from Koinadugu District on the 17/18 January, 1960 but they did not settle for more than one night and it is presumed that they very quickly flew out of the country.

The insect reference collection received a great deal of attention and the specimens of the major orders were reclassified. Over one thousand replacement collections were made and one hundred species added.

AGRICULTURAL CHEMISTRY SECTION

232. The post of Agricultural Chemist which had been vacant since May 1958 was filled by Mr. R. F. Allbrook who took up his duties at the beginning of 1960. His chief tasks during the year were two semi detailed soil surveys at Sorogbwema near Zimi and at Pendembu. In addition a look-see survey was done in the Kailahun District to find a suitable site for the new Cocoa and Coffee Development Station which led to the selection of the Pendembu site.

233. *Sorogbwema*—The soil survey was done at the request of the Colonial Development Co-operation so that the possibility of establishing a Rubber Plantation could be assessed. A total area of 14,000 acres was mapped on a scale of 4 inches to one mile showing footpaths, villages, streams, swamps and some of the area under cultivation. Soil pits were dug at the inter-sections of a mile grid and over 200 profiles were described. Soil samples from 91 pits were analysed at Njala for mechanical separates, moisture, loss of ignition, carbon, nitrogen, phosphate, calcium, magnesium, sodium, potassium and pH. The soils were classified on the basis of the French system as yellow brown ferralites which corresponds roughly to the forest oxysol of the Ghana system. The nutrient status of the soil is low; an average pH of 4.5 bears this out. It was estimated that 10 per cent of the total area is waterlogged for part of the year. It was considered that the area would be suitable for rubber cultivation.

234. *Pendembu*—The analysis of soil samples from this site of about 365 acres selected for the new Cocoa and Coffee Development Station was still in progress at the end of the year. Two points are however already apparent which indicate a high fertility than at Sorogbwema. The pH is found to have an average of about 5.5 thus the mineral content is higher. The soils are rather less clayey but the clay is less laterised, that is the sesquioxide percentage of the clay fraction is less.

235. *Laboratory Work*—This was mainly concerned with analysis of soil from the surveys but some other work was done. Water-analysis of the Taia River was carried out for the Public Works Department. Soil from the Aureol Tobacco Company's nursery at Mabaibunda were tested for suspected chlorine toxicity. This was eventually tracked down to excessive dusting with D.D.T. and was not due to the chloride of potash which was used as a fertilizer.

Improvements on laboratory methods were worked out and have become standard practice including:—

- (a) the addition of 4N NaOH as a dispersing agent in mechanical analysis,
- (b) the use of the Markham stream distillation apparatus for nitrogen determinations (by permission of the West African Institute for Oil Palm Research),
- (c) the extraction of phosphates by hot .1 N NaOH and prevention of readsorption by the use of 8-hydroxyquinoline,
- (d) the use of additional heat in the estimation of carbon,
- (e) the estimation of exchangeable bases and base exchange capacity by percolation (by permission of the West African Institute for Oil Palm Research).

SOIL SURVEY SECTION

236. The field work of the Soil Surveyor was completed in June, 1960

The Surveyor completed necessary analytical work map preparation and the final text of the report at Rothamstead in the United Kingdom later in the year and the printed report is now awaited. This work contains a chapter on the vegetation of the area. It will be of great value in assessing the agricultural potentialities and the preparation of a plan for the agricultural development of this extensive but generally infertile area of the country.

G—NJALA TRAINING COLLEGE

237. *Agricultural Courses*:—Junior staff of the Department are trained at the College, where they receive lectures on a wide variety of agricultural topics and additional mathematics and English.

238. In the fourth year course eleven students who passed the qualifying examination including two students for the West African Institute for Oil Palm Research and one from the Gambia left to take up their appointments

239. The third year course of eleven students including three from the Gambia was reduced to ten students. The second year course consisted of thirteen students as six students failed the qualifying examinations following the first year field course.

240. In February the Agricultural Officer, Njala Training College visited schools in Freetown and Bo to give talks to senior pupils on careers in agriculture. As a result of these visits more applications have been received from pupils of a higher educational standard than in previous years.

241. Throughout the year, 273 letters of application for admission to Njala Training College Agricultural Courses were received by Agricultural Officer, Njala Training College, the majority of these being from pupils of a low educational standard, and a very large number from pupils whose parents or guardians had died leaving no one to pay the school fees.

242. Students trekking was very difficult due to the lack of suitable transport. In February however all the students accompanied by the Agricultural Superintendent-in-Training and Agricultural Officer, Njala Training College, went on a tour of several places of commercial and departmental importance in the Colony including, Agricultural Station, Newton, Mr. Courban's Farm at Songo, Cline Town Rice Mill and the Horticultural Stations at New England, Lumley and Regent.

243. In June a one-year course in commercial agriculture commenced at Njala Training College with thirteen students sponsored as follows:—

Sierra Leone Produce Marketing Board—6

Sierra Leone Agricultural Corporation—5

Aureol Tobacco Company—2

244. The syllabus for this course was Chemistry, Physics, Botany and Zoology for the first three months and then Crop Husbandry, Soils, Fertilizers and Manures, Surveying, Meteorology and Book-keeping. The Crop husbandry course lays emphasis on oil palm, banana, tobacco and rubber. The commercial students also did practical farm work on the College farm.

245. During the year the machinery at the College was augmented by a Massey Fergusson 35 tractor, multi-purpose levelling blade, Ransomes 3-unit gang mower and a monkey winch. Two Hayter scythes were also received for use on the compound. With this machinery it has been possible to continue bush clearing and the College boundaries have been cleared.

246. The nursery was extended in size and continued to be run by the students. The quality and quantity of the crops continued to improve. The usual crops were grown on the farm where the students continued to do the practical work. A rubber plantation of 230 plants was successfully planted during the early rains. The citrus plots supplied the students with a useful supplement to College meals. Numbering and yield recording of the robusta coffee commenced. The Chinese Yam experiment for the year 1959-60 was completed, the students gaining some knowledge and experience of experimentation.

247. Pigs and cattle were not kept but the rabbits and poultry did well.

APPENDIX II—RAINFALL, 1960

Station	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total	Average 10 Years
Musaia	0.00	0.25	0.38	1.70	9.24	10.91	13.71	10.50	17.57	17.40	1.93	0.00	83.59	78.63(8)
Makeni	1.09	0.81	0.81	0.00	11.22	20.26	15.92	18.80	27.66	13.57	7.96	0.82	113.30	123.40
Kontobe	0.00	0.30	0.50	1.64	6.74	20.47	11.44	15.09	18.38	11.17	7.89	0.89	94.51	—
Katonga	0.00	0.05	0.05	1.87	1.98	14.35	23.33	30.41	13.29	8.72	5.75	0.00	99.80	—
Batkanu	0.00	0.11	0.00	0.00	8.11	21.34	15.96	12.65	9.88	13.62	4.45	0.00	85.38	107.96
Rokupr	0.00	0.00	0.00	0.40	7.95	17.27	26.46	24.17	22.88	12.76	3.37	0.09	115.35	116.95
Lungi	0.88	1.17	Trace	0.95	3.24	12.05	32.36	30.12	23.93	7.32	3.81	0.77	116.69	132.5
Newton	0.76	0.02	1.70	0.74	2.44	14.91	26.15	26.55	27.88	7.03	6.29	2.70	114.74	123.8(7)
Waterloo	1.55	0.30	1.92	0.17	3.93	16.11	25.59	20.95	29.45	5.80	6.17	3.49	115.43	—
Hill Station	1.14	0.18	0.33	1.03	5.74	18.63	35.02	57.08	38.88	13.72	5.22	1.74	178.71	176.97
Lumley	0.85	0.69	0.20	0.26	4.16	19.39	19.39	47.65	34.27	6.17	2.13	0.96	116.69	168.27
Njala	Nil	0.50	1.40	4.30	7.65	23.52	16.68	22.69	14.51	11.06	7.30	1.72	111.33	114.8(7)
Bo	0.09	0.14	1.16	3.50	12.03	14.72	17.75	25.98	25.96	11.97	6.36	1.84	121.69	117.34
Bonthe	0.59	0.33	2.42	1.51	8.73	33.11	36.50	34.74	31.40	13.44	4.43	2.53	169.73	142.9
Solon	0.62	Nil	2.00	2.67	10.10	37.94	28.51	36.43	24.99	15.26	1.90	1.74	162.16	179.11
Torma	1.12	0.48	5.49	8.07	10.01	21.48	31.61	37.34	33.16	11.59	3.49	2.55	166.39	152.10
Kenema Farm	0.48	0.98	6.55	4.63	9.68	13.54	13.06	24.40	24.17	13.51	6.02	0.78	117.96	109.55
Kailahun	0.00	0.27	5.41	3.95	11.52	11.19	6.56	14.45	14.35	14.59	5.70	2.82	90.81	100.34
Yengema	0.00	1.91	4.32	2.17	7.70	10.58	N.R.	12.28	20.57	11.30	4.36	2.20	120.62	119.97
Kpuabu	2.20	1.06	5.38	5.67	8.83	13.81	15.79	20.15	20.50	20.09	8.49	0.04	122.01	—

APPENDIX III

SIERRA LEONE WEIGHTS AND MEASURES

The sale of local produce in native markets is almost invariably done by volume. Standard containers which can be readily obtained are used, the commonest being the cigarette tin (cup) and the beer bottle. Larger measures are the four-gallon kerosene tin, and the kerosene case, which held two tins. These are no longer readily available since fuel is now principally supplied in 44-gallon drums or in bulk.

Certain measures became standardised by usage for the major agricultural commodities. The average weight of a kerosene case, heaped up until no more stayed on, was taken as the basis for the "bushel" weight. The Sierra Leone "bushel" is, therefore, considerably greater than the Imperial bushel. It does not even refer strictly to the older "Colonial" bushel used up to 1900, but to the weights of the lots in which commodities are traditionally traded.

The following tables contain most of the Sierra Leone measures.

Basic Measures of Volume:

4 cigarette cups	..	..	..	1 penny-pan
2 penny pans	..	..	..	1 threepence-pan
5 threepence-pans	..	..	..	1 kettle (21 lb. clean rice).
2 kettles	..	..	..	1 can or tin
2 cans or tins	..	..	..	1 "bushel" (84 lb. clean rice)

Standard net weights per bag:

Cocoa	..	..	..	140 lbs.
Coffee	..	..	..	132 lbs.
Ginger	..	..	..	212—235 lbs.
Groundnuts (undecorticated)	..	..	..	77 lbs.
Palm kernels	..	..	..	182½ lbs.
Rice (clean)	..	..	..	168 lbs.
Rice (paddy)	..	..	..	120 lns. (often 150 lbs.)

"Bushel weights"

Benniseed	..	..	..	60 lbs.
Chillies (dried peppers)	..	..	..	28 lbs.
Groundnuts (undecorticated)	..	..	..	36 lbs.
Guinea corn	..	..	..	84 lbs.
Kola nuts ("Measure"—8 kettles)	..	..	..	176 lbs.
Maize	..	..	..	72 lbs.
Palm kernels	..	..	..	60 lbs.
Rice (clean)	..	..	..	84 lbs.
Rice (paddy)	..	..	..	60 lbs.

Miscellaneous Measures

"Bundle" of piassava	..	..	..	56 lbs.
Bottle—reputed quart	..	..	..	1/6th gallon
Bottle—reputed pint	..	..	..	1/12th gallon
Cigarette cup	..	..	..	8 to 9 oz. of rice.
Kettle (clean rice)	..	..	..	21 lbs (2 gallons approximately)
Tin (or can):—	..	..	..	4 gallons
of honey	..	..	..	48 lbs.
of palm oil	..	..	..	38 lbs.

G.P. O/5500/62/550/12.62.

*To be purchased from the Government Bookshop, Water Street, Freetown and from
the Crown Agents for Oversea Governments and Administrations,
4 Millbank, Westminster, London, S.W.1.*

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